

CLAIMS

What is claimed is:

- Sub A 7
- 1 1. A method of producing a representation of a streaming media data at a
2 caching proxy server, said method comprising:
3 transmitting a request for streaming media data to be delivered to said
4 caching proxy server;
5 transmitting a request for data associated with said streaming media
6 data, said request including an identifier which represents one of several
7 possible types of data associated with said streaming media data;
8 receiving said streaming media data and storing said streaming media
9 data on a storage device which is capable of being controlled by said
10 caching proxy server; and
11 receiving said data associated with said streaming media data.
 - 1 2. A method as in claim 1 further comprising:
2 storing said data associated with said streaming media data in said
3 storage device.
 - 1 3. A method for data transmission from a server data processing system ,
2 said method comprising:

Sub A'7

1 8. A method of claim 7, wherein the extensible extended header comprises
2 an extension name and an extension identification (ID) associated with each
3 separate RTP extension.

1 9. A method of claim 3, wherein request may be for one or more type of
2 transmission protocol data at a time.

1 10. A method of claim 3, wherein the response by the server comprising
2 response for each supported transmission protocol data and no response for
3 any unsupported transmission protocol data.

1 11. A method of claim 3, further comprising receiving a request to send the
2 transmission protocol data after sending a response for supported data, and
3 sending only the requested and supported transmission protocol data.

1 12. A method for operating a caching proxy server comprising:
2 sending a request for streaming media data to a server, said request
3 including a request for data associated with said streaming media data, said
4 request including an identifier which represents one of several possible types of
5 data associated with said streaming media data,
6 receiving a response from the server indicating support for the requested
7 streaming media data;

Sub A 7

8 informing the server to send the supported data associated with said
9 streaming media data;
10 receiving the streaming media data from the server;
11 receiving a request from the client to send streaming media data; and
12 sending the requested streaming media data to the client.

1 13. A method of claim 12, wherein said receiving and sending uses a real-
2 time transport protocol (RTP).

1 14. A method of claim 12, wherein said receiving streaming media data from
2 the server is in an extensible extended header format.

1 15. A method of claim 12, wherein said sending a request may be for one or
2 more various and unrelated types of streaming media data to be sent at a time.

1 16. A method of claim 12, wherein said response from the server comprising
2 response for each supported type of streaming media and no response for any
3 unsupported types of streaming media data.

1 17. A method of claim 14, wherein said extensible extended header format
2 is appended before sending to client.

Sub A 7

1 18. A method of claim 17, wherein, appending comprising stripping of name
2 and ID part of the extensible extended header.

1 19. A method of claim 12, further comprising determining if a requested
2 type of streaming media data, that which is required by a caching proxy server
3 to be able to perform its processes, is missing in the response by the server.

1 20. A method of claim 19 further comprising terminating the data
2 transmission process if the requested type of streaming media data is missing in
3 server's response and is critical to the data transmission process.

4 21. A method for extending an RTP header comprising:
5 adding a first RTP sub-extension ID to an RTP header;
6 defining a length of said first RTP sub-extension by providing a sub-
7 extension length;
8 providing data corresponding to the RTP sub-extension ID within said
9 length defined for said first RTP sub-extension; and
10 having subsequent RTP sub-extensions following the first RTP sub-
11 extension.

1 22. A method of claim 21, wherein the length of the RTP sub-extension being
2 defined by a whole number of 32 bit words.

Sub A 7

1 23. A method of claim 21, wherein the first RTP sub-extension immediately
2 following the RTP header.

1 24. A method of claim 21, wherein RTP sub-extension length is immediately
2 followed by RTP sub-extension data and immediately preceded by RTP sub-
3 extension ID.

1 25. A method of claim 21, wherein the RTP sub-extension contains transmit
2 time information of each RTP packet.

1 26. A method of claim 21, wherein the RTP sub-extension contains persistent
2 ID information.

1 27. A method of claim 21, wherein the RTP sub-extension contains Frame
2 Type information.

1 28. A method of claim 27, wherein the frame type being a 16-bit unsigned
2 integer value representing a different frame for each value.

1 29. A method of claim 28, wherein unsigned integer and frame type
2 comprising:

00000000000000000000000000000000

3 assigning an integer value of "0" to an unknown frame type; an integer
4 value of "1" to a key frame type; an integer value of "2" to a p-frame type; and
5 an integer value of "3" to a b-frame type.

1 30. A method of claim 29, wherein said key-frame being most important in
2 priority than any other frames.

1 31. A method of claim 29, wherein said p-frame being less important in
2 priority than key-frame, and more important in priority than b-frame.

1 32. A method of claim 29, wherein said b-frame being less important in
2 priority than p-frame.

1 33. A method of claim 29, wherein said b-frame being less important in
2 priority than key-frame.

1 34. A method of claim 29, wherein said unknown-frame being either more
2 or less important in priority than key-frame, p-frame and b-frame.

1 35. A method of claim 29, wherein said key-frame being more important in
2 priority than p-frames, b-frames, and any other frames.

[illegible]

1 39. A method of claim 36, further comprising receiving a command
2 terminating the negotiation process.

Sub A 7

1 40. A method of negotiating for various types of streaming media data by
2 the caching proxy server comprising:
3 sending a request for one or more types of related or unrelated
4 streaming media data to a server, said request including a request for data
5 associated with said streaming media data, said request including an identifier
6 which represents one of several possible types of data associated with said
7 streaming media data;
8 receiving a response to each requested type of streaming media data;
9 and
10 deciding whether to proceed or terminate negotiation process associated
11 with streaming media data.

1 41. A method of claim 40, wherein deciding comprises:
2 determining if any requested type of streaming media data is not
3 supported by server;
4 checking if unsupported type of streaming media data is essential to
5 caching proxy server operations; and
6 sending an execution command to server.

1 42. A method of claim 40, wherein determining supported types of
2 streaming media data being performed by checking if a response in a form of
3 an echo or otherwise has been sent for requested type of streaming media data.

[illegible]

- 1 47. A method of claim 46, wherein said evaluating comprising:
2 naming unsigned integers to frame types;
3 assigning an integer value of "0" to an unknown frame type; an integer
4 value of "1" to a key frame type; an integer value of "2" to a p-frame type; and
5 an integer value of "3" to a b-frame type.

Sum A_1 7

1 (48. A method of claim 47, wherein said key-frame being most important in
2 priority than any other frames.

1 49. A method of claim 47, wherein said p-frame being less important in
2 priority than key-frame, and more important in priority than b-frame.

1 50. A method of claim 47, wherein said b-frame being less important in
2 priority than p-frame.

1 51. A method of claim 47, wherein said b-frame being less important in
2 priority than key-frame.

1 52. A method of claim 47, wherein said unknown-frame being either more
2 or less important in priority than key-frame, p-frame and b-frame.

1 53. A method of claim 47, wherein said key-frame being more important in
2 priority than p-frames, b-frames, and any other frames.

1 54. A method of claim 46, further comprising:
2 receiving a second message from a client to further thin streaming
3 media data;

Sub A 7
4 processing message and eliminating more selected streaming media data
5 and sending streaming media data of higher priority.

1 55. A method of claim 54, wherein said selected streaming media
2 frame being eliminated being a b-frame, and sending streaming media data
3 with higher priority than b-frame to the client.

1 56. A method of claim 54, wherein said streaming media data being
2 eliminated being a p-frames and b-frame, and sending frames with higher
3 priority than both p-frames and b-frames to the client.

1 57. A method of frame thinning by client comprising:
2 sending a message to a caching proxy server, said message indicating a
3 need to thin streaming media data received at said client;
4 receiving media back from said caching proxy server that are higher in
5 order than low order streaming media data.

1 58. A method of claim 57, further comprising:
2 sending a subsequent message from a client to further thin streaming
3 media data;
4 receiving streaming media data that is higher in order then previous
5 streaming media data received.

sub A¹ 7

1 59. A method of claim 57, further comprising:
2 assigning an unsigned integer to a frame associated with streaming
3 media data, wherein said assigning further comprising assigning an integer
4 value of "0" to an unknown frame type; an integer value of "1" to a key frame
5 type; an integer value of "2" to a p-frame type; and an integer value of "3" to a
6 b-frame type.

1 60. A method of claim 59, wherein said key-frame being most important in
2 priority than any other frames.

1 61. A method of claim 59, wherein said p-frame being less important in
2 priority than key-frame, and more important in priority than b-frame.

1 62. A method of claim 59, wherein said b-frame being less important in
2 priority than p-frame.

1 63. A method of claim 59, wherein said b-frame being less important in
2 priority than key-frame.

1 64. A method of claim 59, wherein said unknown-frame being either more
2 or less important in priority than key-frame, p-frame and b-frame.

1 65. A method of claim 59, wherein said key-frame being more important in
2 priority than p-frames, b-frames, and any other frames.

1 66. A method of claim 58, wherein said sending comprising eliminating p-
2 frames and sending selected streaming media data that is higher in order than
3 p-frames to the client.

67. A method of claim 58, wherein said sending comprising eliminating both p-frames and b-frames, and sending selected streaming media data that is higher in order than both p-frames and b-frames.

68. A method of using transmit time of RTP packet transmissions at a caching proxy server said method comprising:

- requesting data corresponding to transmit time for streaming media data from a server;
- receiving said streaming media data and corresponding transmit time information from the server;
- storing the received information; and
- transmitting from said caching proxy server to a client said streaming media data at times specified by said transmit time.

Sub A 7

1 69. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to
3 perform operations for producing a streaming media data at a caching proxy
4 server comprising:
5 transmitting a request from for streaming media data to be delivered to
6 said caching proxy server;
7 transmitting a request for data associated with said streaming media
8 data, said request including an identifier which represents one of several
9 possible types of data associated with said streaming media data;
10 receiving said streaming media data and storing said streaming media
11 data on a storage device which is capable of being controlled by said
12 caching proxy server; and
13 receiving said data associated with said streaming media data.

1 70. A machine-readable medium as in claim 69 further comprising:
2 storing said data associated with said streaming media data in said storage
3 device.

1 71. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to
3 perform data transmission operations from a server data processing system
4 comprising:

5 receiving a request for streaming media data, said request including a
6 request for data associated with said streaming media data, said request
7 including an identifier which represents one of several possible types of data
8 associated with said streaming media data;
9 responding to the request with a response indicating a capability of said
10 server to support the request; and
11 sending the requested data associated with said streaming media data.

72. A machine-readable medium as in claim 71, wherein said sending uses a
real-time transport protocol (RTP).

1 73. A machine-readable medium as in claim 71, wherein said request may be
2 made by a caching proxy server or a client.

Sub A 71

6 request including an identifier which represents one of several possible types of
7 data associated with said streaming media data;
8 receiving a response from said server indicating support for the
9 requested streaming media data;
10 informing said server to send the supported data associated with said
11 streaming media data;
12 receiving the supported streaming media data from said server;
13 receiving a request from a client to send streaming media data; and
14 sending the requested streaming media data to said client.

1 81. A machine-readable medium as in claim 80, wherein said receiving and
2 sending uses a real-time transport protocol (RTP).

1 82. A machine-readable medium as in claim 80, wherein said receiving
2 streaming media data from the server is in an extensible extended header
3 format.

1 83. A machine-readable medium as in claim 80, wherein said sending a
2 request may be for one or more various and unrelated types of streaming media
3 data to be sent at a time.

Sub A 7

89. A machine-readable medium that provides executable instructions, which when executed by a set of processors, cause said set of processors to perform RTP header extending operations comprising:

- adding a first RTP sub-extension ID to an RTP header;
- defining a length of the first RTP sub-extension by providing a sub-extension length;
- providing data corresponding to the RTP sub-extension ID within said length defined for said first RTP sub-extension; and
- having subsequent RTP sub-extensions following the first RTP sub-extension.

1 90. A machine-readable medium as in claim 89, wherein said length of said
2 RTP sub-extension being defined by a whole number of 32 bit words.

1 91. A machine-readable medium as in claim 89, wherein said first RTP sub-
2 extension immediately following the RTP header.

92. A machine-readable medium as in claim 89, wherein said RTP sub-extension length is immediately followed by RTP sub-extension data and immediately preceded by RTP sub-extension ID.

Sub A 7

1 93. A machine-readable medium as in claim 89, wherein said RTP sub-
2 extension contains transmit time information of each RTP packet.

1 94. A machine-readable medium as in claim 89, wherein said RTP sub-
2 extension contains persistent ID information.

1 95. A machine-readable medium as in claim 89, wherein said RTP sub-
2 extension contains RTP Frame Type information.

1 96. A machine-readable medium as in claim 95, wherein said frame type
2 being a 16-bit unsigned integer value representing a different frame for each
3 value.

1 97. A machine-readable medium as in claim 96, wherein said unsigned
2 integer and frame type further comprising steps of:
3 assigning an integer value of "0" to an unknown frame type; an integer value
4 of "1" to a key frame type; an integer value of "2" to a p-frame type; and an
5 integer value of "3" to a b-frame type.

1 98. A machine-readable medium as in claim 97, wherein said key-frame
2 being most important in priority than any other frames.

52A₁ 799.

1 99. A machine-readable medium as in claim 97, wherein said p-frame being
2 less important in priority than key-frame, and more important in priority than
3 b-frame.

1 100. A machine-readable medium as in claim 97, wherein said b-frame being
2 less important in priority than p-frame.

1 101. A machine-readable medium as in claim 97, wherein said b-frame being
2 less important in priority than key-frame.

1 102. A machine-readable medium as in claim 97, wherein said unknown-
2 frame being either more or less important in priority than key-frame, p-frame
3 and b-frame.

1 103. A machine-readable medium as in claim 97, wherein said key-frame
2 being more important in priority than p-frames and b-frames other frames.

1 104. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to
3 perform negotiating operations for various types of streaming media data by a
4 server comprising:

NAME	AGE	SEX	STATUS	REL	EDUC	INDUSTRY	INCOME	REASON	DATE
JOHN	35	M	W	1	12	1	1	1	1
MARY	32	F	W	2	10	2	2	2	2
JOHN	30	M	W	3	8	3	3	3	3
MARY	28	F	W	4	6	4	4	4	4
JOHN	25	M	W	5	4	5	5	5	5
MARY	22	F	W	6	2	6	6	6	6
JOHN	20	M	W	7	1	7	7	7	7
MARY	18	F	W	8	0	8	8	8	8
JOHN	15	M	W	9	-1	9	9	9	9
MARY	12	F	W	10	-2	10	10	10	10
JOHN	10	M	W	11	-3	11	11	11	11
MARY	8	F	W	12	-4	12	12	12	12
JOHN	5	M	W	13	-5	13	13	13	13
MARY	3	F	W	14	-6	14	14	14	14
JOHN	1	M	W	15	-7	15	15	15	15
MARY	0	F	W	16	-8	16	16	16	16

5 receiving a request for one or more types of streaming media data from a
6 caching proxy server or a client, said request including a request for data
7 associated with said streaming media data, said request including an identifier
8 which represents one of several possible types of data associated with said
9 streaming media data;

1 105. A machine-readable medium as in claim 104, further comprising
2 receiving a request to send supported RTP extensions to the caching proxy or
3 the client.

1 107. A machine-readable medium as in claim 104, further comprising
2 receiving a command terminating the negotiation process.

1 108. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to
3 perform negotiating operations for various types of streaming media data by a
4 caching proxy server comprising:

5 sending a request for one or more types of related or unrelated
6 streaming media data to a server, said request including a request for data
7 associated with said streaming media data, said request including an identifier
8 which represents one of several possible types of data associated with said
9 streaming media data;

10 receiving a response to each requested type of streaming media data;

11 and

12 deciding whether to proceed or terminate negotiation process associated
13 with streaming media data.

1 109. A machine-readable medium as in claim 108, wherein deciding
2 comprises:

3 determining if any requested type of streaming media data is not
4 supported by server;

5 checking if unsupported type of streaming media data is essential to
6 caching proxy server operations; and
7 sending an execution command to server.

[illegible]

Sub A₁ 7 110

1 110. A machine-readable medium as in claim 108, wherein determining
2 supported types of streaming media data being performed by checking if a
3 response in a form of an echo or otherwise has been sent for requested type of
4 streaming media data.

1 111. A machine-readable medium as in claim 109, wherein said execution
2 command being send based on results of checking if unsupported type of
3 streaming media data is essential to caching proxy server operations.

1 112. A machine-readable medium as in claim 108, wherein said decision
2 being to terminate negotiation process.

1 113. A machine-readable medium as in claim 108, wherein said decision
2 being to proceed with negotiation process and requesting the server to send
3 remaining supported type of streaming media data.

1 114. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to
3 perform frame thinning operations by a caching proxy server comprising:
4 receiving a message from a client to thin frames in a streaming media
5 data transmission from said caching proxy server;
6 evaluating priority of frames; and

7

1

2

3

4

5

6

1

2

1

2

3

1

2

1

2

1 129. A machine-readable medium as in claim 125, wherein said p-frame being
2 less important in priority than key-frame, and more important in priority than
3 b-frame.

1 130. A machine-readable medium as in claim 125, wherein said b-frame being
2 less important in priority than p-frame.

1 131. A machine-readable medium as in claim 125, wherein said b-frame being
2 less important in priority than key-frame.

1 132. A machine-readable medium as in claim 125, wherein said unknown-
2 frame being either more or less important in priority than key-frame, p-frame
3 and b-frame.

1 133. A machine-readable medium as in claim 125, wherein said key-frame
2 being more important in priority than p-frames, b-frames and any other frames.

1 134. A machine-readable medium as in claim 126, wherein said eliminating
2 comprising eliminating p-frames and sending selected frames that are higher in
3 order than p-frames to the client.

Sub A₁⁽¹⁾ 7₁₃

1 136. A machine-readable medium that provides executable instructions,
2 which when executed by a set of processors, cause said set of processors to send
3 transmit time of RTP packet transmission operations from a caching proxy
4 comprising:

7 receiving said streaming media data corresponding with transmit time
8 information from the server;

10 transmitting from said caching proxy server to a client, said streaming
11 media data at times specified by said transmit time.

74

say A17

4 means for transmitting a request for data associated with said streaming
5 media data, said request including an identifier which represents one of
6 several possible types of data associated with said streaming media data;
7 means for receiving said streaming media data and storing said
8 streaming media data on a storage device which is capable of being
9 controlled by said caching proxy server; and
10 means for receiving said data associated with said streaming media data.

1 138. A server data processing system comprising:

2 means for receiving a request for streaming media data, said request
3 including a request for data associated with said streaming media data, said
4 request including an identifier which represents one of several possible types of
5 data associated with said streaming media data;

6 means for responding to the request with a response indicating a
7 capability of the server to support the request; and

8 means for sending the requested data associated with said streaming
9 media data.

1 139. A caching proxy server comprising:

2 means for sending a message for streaming media data to a server, said
3 request including a request for data associated with said streaming media data,

Sub A₄ 7s

4 / said request including an identifier which represents one of several possible
5 types of data associated with said streaming media data;
6 means for receiving a response from the server indicating support for the
7 requested streaming media data;
8 means for informing the server to send the supported data associated
9 with said streaming media data;
10 means for receiving the streaming media data from the server;
11 means for receiving a request from the client to send streaming media
12 data; and
13 means for sending the requested streaming media data to the client.

1 140. A RTP header comprising:

2 means for adding a first RTP sub-extension ID to an RTP header;
3 means for defining a length of said first RTP sub-extension by providing
4 a sub-extension length;
5 means for providing data corresponding to the RTP sub-extension ID
6 within said length defined for said first RTP sub-extension; and
7 means for having subsequent RTP sub-extensions following the first RTP
8 sub-extension.

1 141. A server comprising:

Sub A 7

2 means for receiving a request for one or more types of streaming media
3 data from a caching proxy server or a client, said request including a request for
4 data associated with said streaming media data, said request including an
5 identifier which represents one of several possible types of data associated with
6 said streaming media data;
7 means for determining if requested types of streaming media data are
8 supported by the server; and
9 means for responding to the request with a response indicating the
10 capability of the server to support the request.

1 142. A caching proxy server comprising:

2 means for sending a request for one or more types of related or
3 unrelated streaming media data to a server, said request including a request for
4 data associated with said streaming media data, said request including an
5 identifier which represents one of several possible types of data associated with
6 said streaming media data;
7 means for receiving a response to each requested type of streaming
8 media data; and
9 means for deciding whether to proceed or terminate negotiation process
10 associated with streaming media data.

1 143. A frame thinning caching proxy server comprising:

Sub A₂ 7

2 (means for receiving a message from a client to thin frames in a streaming
3 media data transmission from said caching proxy server;
4 means for evaluating priority of frames; and
5 means for sending only selected frames.

1 144. A client comprising:
2 means for sending a message to a caching proxy server, said message
3 indicating a need to thin streaming media data received at said client;
4 means for receiving media back from caching proxy server that are
5 higher in order than low order media.

1 145. A caching proxy server comprising:
2 means for requesting data corresponding to transmit time for streaming
3 media data from a server;
4 means for receiving said streaming media data and corresponding
5 transmit time information from the server;
6 means for storing the received information; and
7 means for transmitting from said caching proxy server to a client said
8 streaming media data at times specified by said transmit time.